FHWA Roadway Construction Noise Model (RCNM)

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Roadway Construction Noise

- **Construction is often conducted in close proximity to residences and businesses**

- **Should be controlled and monitored to avoid excessive noise impacts**

Examples of Existing Guidance

- **FHWA 1977 handbook**

  Highway Construction Noise: Measurement, Prediction and Mitigation

  - **Manual method for prediction**

- **FHWA 1982 prediction tool**

  HICNOM, a highway construction noise computer program

  - **Data-intensive and comprehensive method**
  - **Primarily used for highly complex or controversial major urban projects**

Time for Guidance Updates

- **Updated construction equipment**
- **Extensive highway construction projects in the U.S. and Canada**
  - **Lessons learned**
  - **Simple prediction tools available**

Central Artery/Tunnel Project in Boston ("Big Dig")

- **Largest urban construction project ever conducted in the U.S.**
  - **7.5 miles (161 lane miles)**
  - **Includes underground expressway, river bridge, harbor tunnel, elevated highway demolition, park creation**
  - **24 hours/day**
  - **Thousands of residential and commercial abutters**

Big Dig Noise Control Program

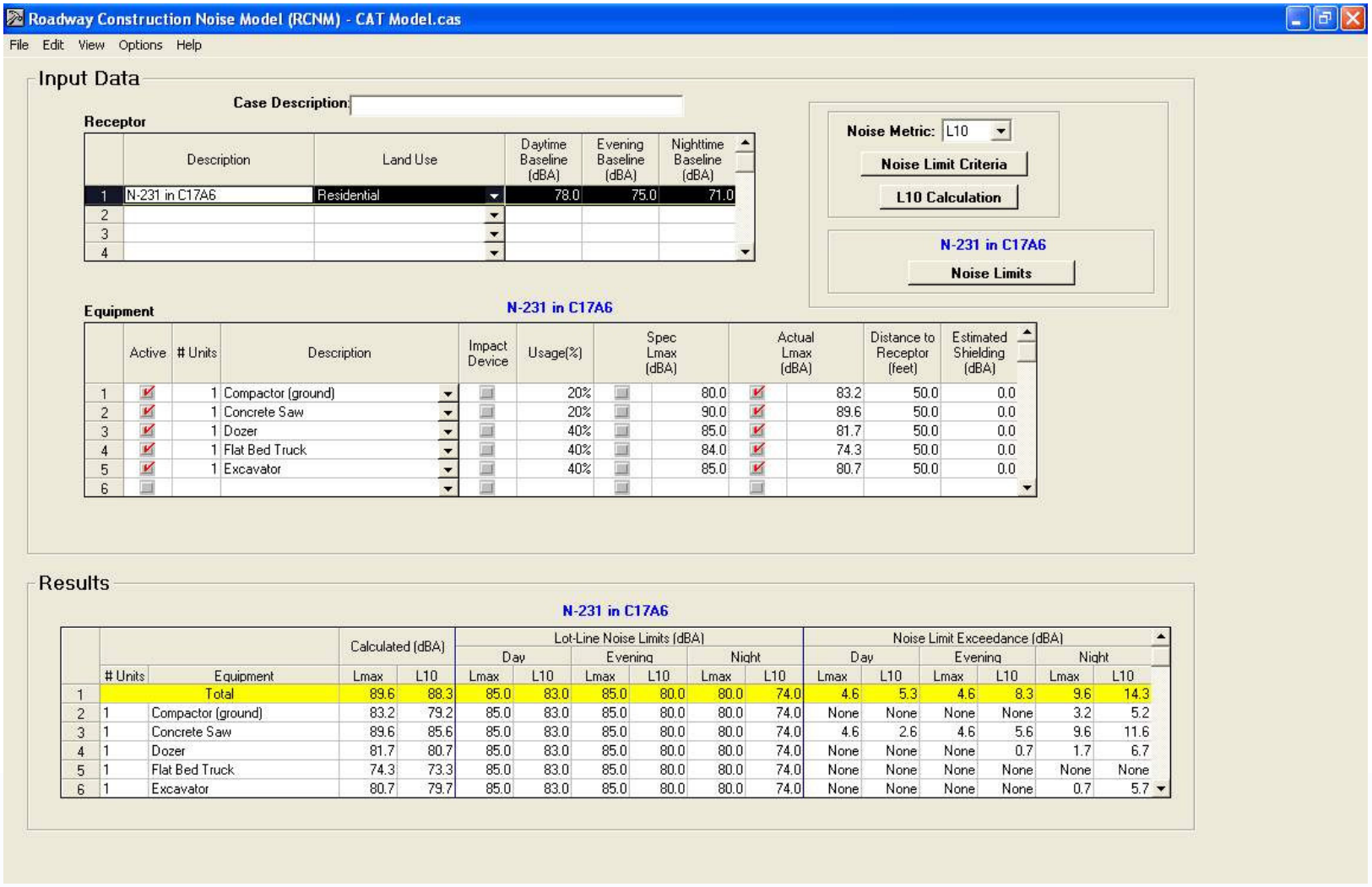
- **Construction Noise Control Specification 721.560**
  - Most comprehensive in the U.S.
  - Includes proactive mitigation based on predictions

- **Construction noise prediction spreadsheet developed by Erich Thalheimer of Parsons Brinckerhoff Quade & Douglas, Inc.**
  - RCNM is based on the Big Dig prediction spreadsheet

RCNM

- **Windows-based program**
  - **Incorporates noise calculations and equipment database from Big Dig spreadsheet**
- **Screening tool**
  - **Enables calculations of construction noise levels in more detail than manual methods while avoiding extensive input data collection**
  - **Two main uses:**
    - **Easily predict construction noise levels**
    - **Determine compliance with noise limits**
- **Applicable to a variety of construction noise projects of varying complexities**

RCNM Screen



Roadway Construction Noise Model (RCNM) - CAT Model.cas

File Edit View Options Help

Input Data

Case Description:

Receptor

	Description	Land Use	Daytime Baseline (dBA)	Evening Baseline (dBA)	Nighttime Baseline (dBA)
1	N-231 in C17A6	Residential	78.0	75.0	71.0
2					
3					
4					

Noise Metric: L10

Noise Limit Criteria

L10 Calculation

N-231 in C17A6

Noise Limits

Equipment

N-231 in C17A6

	Active	# Units	Description	Impact Device	Usage(%)	Spec Lmax (dBA)	Actual Lmax (dBA)	Distance to Receptor (feet)	Estimated Shielding (dBA)
1	☑	1	Compactor (ground)	☐	20%	80.0	83.2	50.0	0.0
2	☑	1	Concrete Saw	☐	20%	90.0	89.6	50.0	0.0
3	☑	1	Dozer	☐	40%	85.0	81.7	50.0	0.0
4	☑	1	Flat Bed Truck	☐	40%	84.0	74.3	50.0	0.0
5	☑	1	Excavator	☐	40%	85.0	80.7	50.0	0.0
6	☐			☐			☐		

Results

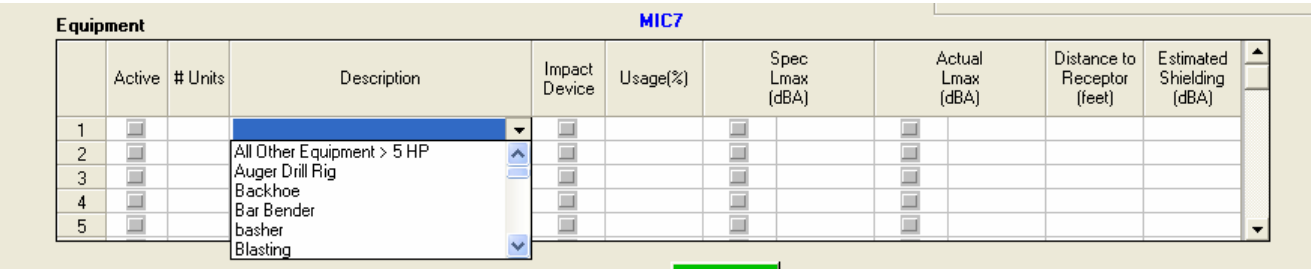
N-231 in C17A6

			Calculated (dBA)		Lot-Line Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
					Day		Evening		Night		Day		Evening		Night	
	# Units	Equipment	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10
1		Total	89.6	88.3	85.0	83.0	85.0	80.0	80.0	74.0	4.6	5.3	4.6	8.3	9.6	14.3
2	1	Compactor (ground)	83.2	79.2	85.0	83.0	85.0	80.0	80.0	74.0	None	None	None	None	3.2	5.2
3	1	Concrete Saw	89.6	85.6	85.0	83.0	85.0	80.0	80.0	74.0	4.6	2.6	4.6	5.6	9.6	11.6
4	1	Dozer	81.7	80.7	85.0	83.0	85.0	80.0	80.0	74.0	None	None	None	0.7	1.7	6.7
5	1	Flat Bed Truck	74.3	73.3	85.0	83.0	85.0	80.0	80.0	74.0	None	None	None	None	None	None
6	1	Excavator	80.7	79.7	85.0	83.0	85.0	80.0	80.0	74.0	None	None	None	None	0.7	5.7

RCNM Input

- **Receptor**
  - Allows multiple receptors
  - Land use (residential, commercial, industrial)
  - Baseline sound levels (Leq or L10, A-weighted)

- **Equipment**
  - Up to 15 types of equipment
  - Distance to receptor
  - Estimated shielding between equipment and receptor

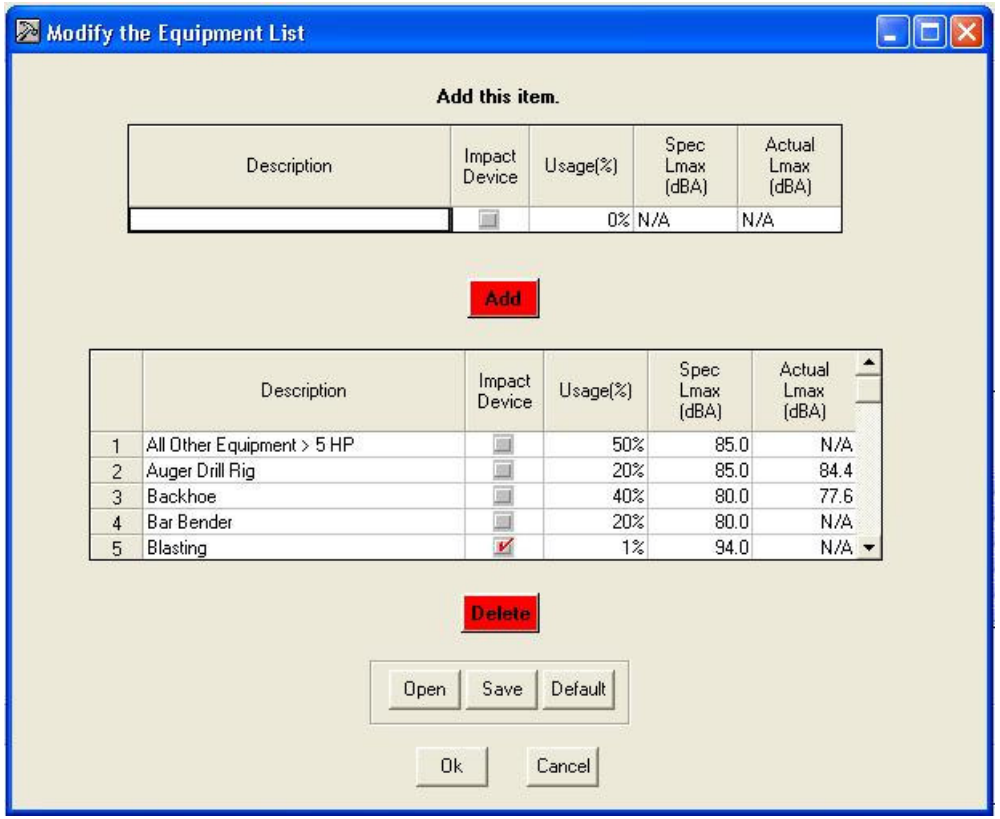


RCNM Construction Equipment Database

- **Big Dig database**
  - Over 50 types of equipment
  - Lmax dBA @ 15m (50 ft), slow
  - Includes spec and measured levels

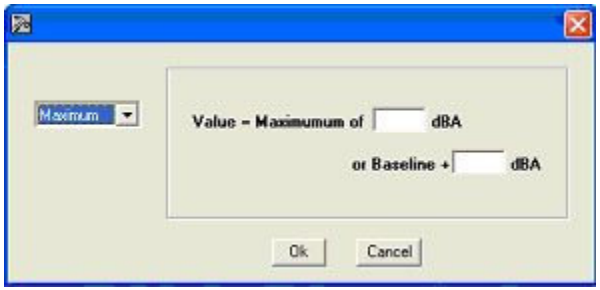
RCNM Input (continued)

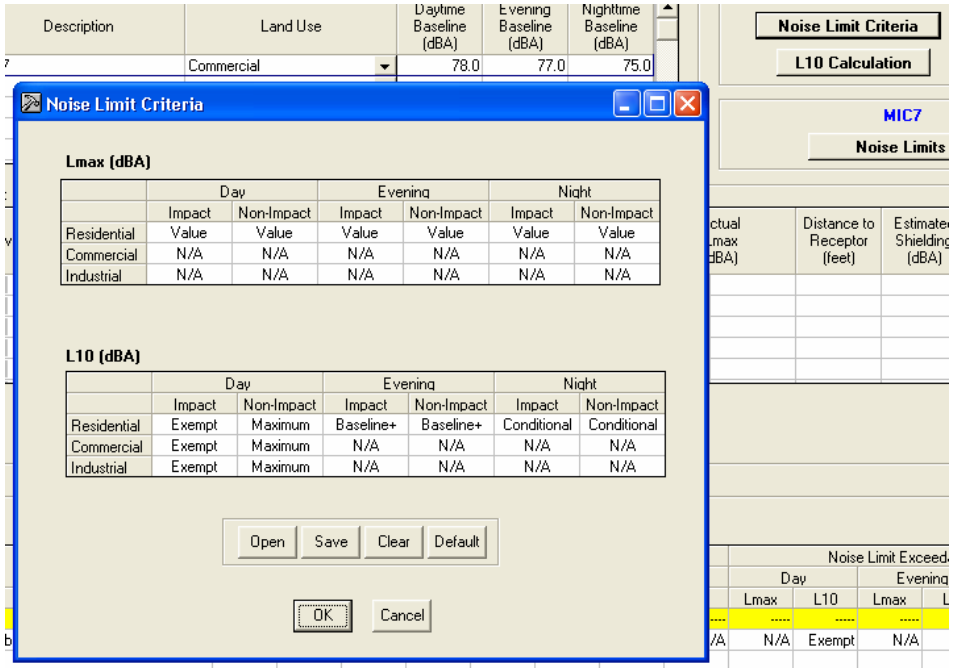
- **Equipment database can be modified**
  - **Equipment can be added or deleted**
  - **Default values can be restored**



RCNM Input (continued)

- **Choice of Leq or L10 (A-weighted) for display**
- **Noise limit criteria**
  - **Can use Big Dig default values or enter new criteria based on local ordinances**
  - **Entry is achieved through a pull-down menu with conditional options**





RCNM Calculations

- **Calculations account for spherical spreading and can adjust for shielding (guidance given for estimating shielding)**

- **Calculates Lmax, Leq, L10 (A-weighted) for each equipment type and as totals**
  - **Leq calculations based on Lmax**
  - **L10 = Leq + 3 dBA**
    - **Based on extensive Big Dig data**
    - **Offset can be modified by user**

- **Calculates noise limit exceedances based on baseline noise levels and lot-line noise limits**

RCNM Output

- **Calculated Lmax and Leq or L10 levels**
  - **By equipment type**
  - **As totals**

- **If noise limit criteria defined, will display …**
  - **Lot-line noise limits**
  - **Noise limit exceedances**

Results

N-231 in C17A6

			Calculated (dBA)		Lot-Line Noise Limits (dBA)						Noise Limit Exceedance (dBA)					
					Day		Evening		Night		Day		Evening		Night	
	# Units	Equipment	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10	Lmax	L10
1		Total	89.6	88.3	85.0	83.0	85.0	80.0	80.0	74.0	4.6	5.3	4.6	8.3	9.6	14.3
2	1	Compactor (ground)	83.2	79.2	85.0	83.0	85.0	80.0	80.0	74.0	None	None	None	None	3.2	5.2
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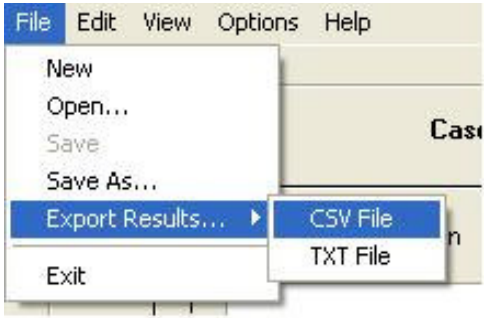
RCNM Case and Files

- **User's can save …**
  - **Case with all receptors, equipment, results**
  - **Modified equipment database**

- **User's can export case to …**
  - **Comma-delimited file**
  - **Text file**



RCNM Availability

- In final stages of testing
- Will be available without cost or obligation
- Distribution
  - Will be downloadable from the web
  - Will be included on upcoming construction noise CD-ROM

Side Topic: Construction Noise Handbook and CD-ROM

- **Soren Pedersen & Harvey Knauer**

Purpose

- **Update the 1977 FHWA document**
- **Incorporate experiences related to construction noise since 1977**
- **Include up-to-date references**
  - **Equipment levels**
  - **Mitigation techniques**
  - **Contacts**
- **Incorporate latest modeling techniques**

Handbook/CD-ROM Organization

Chapter 1: Introduction	**Chapter 2: Technology**	**Chapter 3: Effects of Construction Noise**	**Chapter 4: Construction Noise Criteria and Metrics**
Chapter 5: Measurement of Construction Noise	**Chapter 6: Prediction of Construction Noise**	**Chapter 7: Mitigation of Construction Noise**	**Chapter 8: Construction Equipment Noise Levels and Ranges**
Chapter 9: Construction Noise Experiences and Contacts	**Chapter 10: Construction Noise Related Training Materials**	**Chapter 11: Public Involvement**	**Chapter 12: Coordination**

Use of the Handbook/CD-ROM

- Handbook will serve as a summary document
- CD-ROM will contain more details, photos, and “clickable” links to data sources and references

Example of CD-ROM Use

Questions or Comments?